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ABSTRACT

The introductory chapter provides an overview on mathematics instruction in Kenyan schools. A survey was conducted largely in the Kigumo division in Murang'a District Central Province to determine problems affecting mathematics instruction in Junior Secondary classes and measures to improve standards. Respondents were 20 head teachers not necessarily mathematics-oriented and 20 mathematics teachers in Forms 1 and 2. The 19-item questionnaire requested information about teachers and their attitudes and competence. Interviews were conducted on how mathematics instruction could be improved. Data are summarized on qualifications, experience, time devoted to mathematics, pupil attitudes, availability of instructional materials, teacher commitment, teaching adequacy, frequency of meetings, allocation of duties, factors affecting achievement, opinions on improving instruction, rating of teaching methods, and relevance of the syllabus. Teachers' comments on mathematics performance are included. The major problems identified were: mathematics curriculum change, shortage of trained mathematics teachers, poor foundation in mathematics at primary level, irregular in-service training, and pupils' belief that mathematics is difficult. Providing frequent in-service, sufficient materials and guidelines, teacher involvement in curriculum development, better terms of employment, exposure to testing procedures, and better communication were suggested. Appendices contain the questionnaires. (MNS)

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PROBLEMS OF TEACHING JUNIOR SECONDARY MATHEMATICS IN KENYA.

ASD Project

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This research project was undertaken as part of a training programme jointly organised on behalf of the African Curriculum Organisation (ACO) by the Kenya Institute of Education (KIE), the University of Nairobi, and the German Agency for Technical Cooperation (GTZ).

PROBLEMS OF TEACHING JUNIOR SECONDARY MATHEMATICS IN KENYA

MBIRURU W. N. K.

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TABLE OF CONTENT

		Page
Acknowledgement		(i)
CHAPTER I:	Introduction ----------	1
	The Problem ----------	1
	Materials and class sizes --------	6
	Purpose of the study ----------	8
CHAPTER II:	Methodology ----------	9
	The Population ----------	9
	Procedure for selecting the Population sample ----------	10
	Instruments for the Data ---------	10
	Administration for the questionnaires - - - - - - - - - -	12
CHAPTER III:	Data analysis and findings -------	13
CHAPTER IV:	Conclusion ----------	25
APPENDIX I	Questionnaire for Heads of Secondary Schools ----------	28
APPENDIX II	Questionnaire for Teachers ------	33

CHAPTER I

INTRODUCTION

Mathematics is an important subject not only in the education system but also in the development of a nation. Mathematics is one of the indispensable subjects in any education system. In Kenya mathematics is compulosry subject up to secondary level except in Form 5 and Form 6 where it is an option. At the university, most courses demand at least a credit pass in mathematics at 'O' level. Basic mathematics is taught up to Form 4.

In the last two decades there has been a re-examination of the content of school courses, the methods of teaching and of examination syllabuses. The changes in the mathematics has attracted a lot of interest, infact more than any other other subject. Members of the public were puzzled by the so called 'modern' mathematics when it was introduced in 1966. However the public has criticized the mathematics that was being taught to their children. The criticisms continued for more than a decade and very little was done to find solutions to the problems. The criticisms included the content of the subject and the materials used. This study will revolve around these three issues but other aspects will be mentioned. The public outcry necessisted the President of the Republic of Kenya to give a decree to change from 'new' maths to 'traditional' maths in the late 1980. 'Traditional' mathematics was to be started by January 1981.

THE PROBLEM

Changes in the mathematics syllabus have been accompanied by considerable changes in the text books and teachers guides used in both primary and secondary schools. Before the introduction of the 'modern' mathematics most text books were directly informative and somehow written for the teaher rather than for the student. The books that accompanied

'modern' mathematics were more exploratory and addressed to the pupils. They were intended not for solitary reading but for practical activities in groups. In 'modern' mathematics there is a different treatment in geometry and a reduction in amount of computation and algebraic manipulation. Emphasis on fundamental ideas is paramount, reducing the acquisation of techniques and offering more scope for intuition, curiosity in order to create more interest in the subject. Some of the contents previously covered in traditional mathematics were however retained. All what differed in traditional and 'new' mathematics curricula is the approach to mathematical teaching. Unfortunately most people assumed or even were convinced that 'new' mathematics was a new subject matter compared to the traditional mathematics. What happened is that some topics such as sets, transformations, relations, mapping and functions, probability and statistics etc; were traditionally taught at the university level were brought down to school mathematics. This implies that there was nothing like 'new' mathematics. The name was imposed probably because of the new contents and the new approach of teaching mathematics. Further more the so called new contents existed many centuries before.

However, what ever the criticisms and what ever was done was not well done. For a long time since 1966 the 'modern' mathematics sysllabus and the materials to support it never had a major review or revision inspite of public outcry on the unsatisfactory condition that prevailed in mathematics. Although intially statistics show that there were high number of passes in 'new' mathematics than in traditional mathematics the situation has deteriorated. Further more those schools which were doing 'new' maths were the already well established schools with better students, compared with the poorly established schools which persisted on traditional mathematics. The reasons for this persistent included; lack of funds to buy new materials and lack of trained staff to teach the new syllabus. In this context the statistic was somehow biased. However the traditional maths

was being gradually phased out and secondary schools were expected to change to 'modern' mathematics by 1980. The new syllabus is now being taught in Form 3 who will sit for the first examination in 1984.

The problem of teaching mathematics in forms 1 and 2 (junior secondary classes) may have originated from primary schools. The introduction of the new syllabus may not solve the problems completely. The main problems are the teacher and the methodology. About 48% of primary school teachers in Kenya are untrained. In some schools these teachers are allocated to middle classes standard 4 and 5. In others they are allocated to teach in standards 6 and 7. The reason for this is to avoid the untrained teachers to mess about with the early stages of the pupils education, i.e, they cannot be allocated to teach standard 1 to 3. While in standard 4 and 5 the pupils are a little bit mature, it is thought that less harm will be done. Although the same reason may apply for standards 6 and 7 it is likely that the certificate of primary education examination (CPE) results would be poor because of the poor teaching. This claim may be supported by the C.P.E. results every year, where in the regions with more trained teachers C.P.E. results are better than in regions with more untrained teachers.

The certificate of primary education examination is in the form of multiple choice questions. The teaching may likely be orienteted towards this type of the examination. This may encourage memorization of facts and concepts at the expense of problem solving techniques and organisation of work. Problem solving and organisation of work are demanded in secondary schools and teachers waste valuable time emphasising on these techniques.

If the child will not have achieved the above during his first two years in secondary he may not recover at all.

Due to the untrained teachers and sometimes trained teachers ignorance, pupils may be exposed to undue rigors and obstraction not minding the pupils ability. This may result in a strainous situation on the side of the pupils, leading to disliking the subject and misinterpreting the subject as a difficult one to persue further. A primary child who has this attitude may not succeed at secondary school. Under-rating is equally harmful. The child may take things for granted, to find later that he cannot cope with the secondary school mathematics. Such a child may assume that he has not covered enough previously and hence too much is expected of him, there after losing the grip and interest of the subject. Lack of proper preparation by teachers is a major contributor to poor performance in mathematics in primary schools.

As mentioned earlier pupils in most primary schools are normally drilled on multiple choice type of questions and very little attention, if any, is given to problem solving techniques. The pupils get to an extent of mastering how to guess the correct answers. They are given several mock papers for practice before the main examinations.

An example of 'O' level mathematics multiple choice paper may support this claim. A student would score as high as 50 out of 60 in a multiple choice paper, but would get 20% in the second written paper where his mathematical competence is properly tested, yet such a student is awarded a pass or even a credit. The multiple choice paper was found to be misleading and was replaced by one comprised of section A which included short answer questions with all the working to be shown in the spaces provided and section B which included long answer type of questions. This called for more practice in mathematics by students and it seems to have some good effect. The 1982 results were better than in the previous 3 years.

At secondary school, form I students are handled differently by the teachers. The teachers are either trained graduates, SI teachers or untrained graduate teachers whose choice of teaching profession was either a last resort or a natural interest. The later is very rare. There is another category of teachers and these are untrained teachers who are 'A' level and sometimes 'O' level school leavers. The last category teach in Harambee and private secondary schools because of the shortage of teachers and financial problems on the side of the schools. Normally the more experienced teachers are allocated to the senior classes so as to prepare students for national exams. The junior classes are allocated the less experienced teachers. In mathematics there is a shortage of teachers and some of those teachers who are trained, mathematics is a second or a third subject or he passed it at 'O' level or attempted it at 'A' level but was not trained to teach the subject at all. The situation is pathetic in Harambee and private secondary schools where low quality teachers are themeselves 'O' level school leavers. The Kenya Junior Secondary Examinations (KJSE) which is mainly offered by the low grade or ungraded schools would support the above claim.

There are various methods that can be used to teach mathematics. These include heuristic method, guided discovery method and the lecture method to mention a few. While heuristic method is thought to be one of the best, guided discovery is frequently ignored and the lecture method is more often used. Lecture method is the easiest to practice on particularly by teachers who want to avoid questions or to dominate in the classroom. Some teachers believe in covering the syllabus as fast as they can and the only way to do this is to use the lecture method. If the content of the syllabus is large such that it would not be completed in good time, this would call for lecture method to be applied. In such cases quality of the teaching is not considered; projects advocated by books, construction of models and such activities useful in teaching of mathematics are not carried out.

All what is involved is sheer imagination by the teacher and students. It is not suprising that some students will not know how a cone or a pyramind looks like in the actual situation leave alone constructing it. This is one of the problems of school mathematics of East Africa (SMEA) books. For good thorough teaching, form one and form two work is not completed in time. Those who hurry to do so, do not teach well and may unecessarily escape several topics.

Assignments and tests are useful for both teachers and students to evaluate their achievements. The teacher will discover the students weaknesses and the students will know their weaknesses. This might bring about co-operation between the teacher and the students. Most teachers do not give assignments and if any it is never marked. This is one of the reasons given by students who are engaged in riots. Assignments which are marked and returned to students (after recording) to see their performance are extremely effective and lead to improvement by students. Infact assignments serve as a way of motivating the students. Where no such assignments are given and marked, the students will hopelessly wait for the end of term examinations whose results is a further discouragement. If the teacher has no interest in the subject (maths) and has been forced to teach it by the prevailing circumstances against his will, this may happen and normally happens in lower classes in secondary schools. Very little attention is give to the lower forms, sometimes they even do without maths teachers assuming that their work in maths is cheap and will be able to cover in future. Then, how are they expected to improve if their background or foundation for that matter is extremely shaky?

Materials and Class Sizes

In Kenya, schools are categorised in grades A, B, C and D. Some schools are not graded e.g. harambee schools and private schools but they are linced to exist and may be upgraded whenever they improve

linced

their conditions. The grade A and B schools get full government support including funds and teachers. These schools have the best teachers and facilities and their performances are far much better than those of grades C, D and others. The later grades, i.e. C, D, and others schools, have inferior facilities and always have problems of teaching staff particularly in the key subjects such as mathematics. These schools out number the A & B grades by far. They are (C, D and others), the same schools which have congested classrooms. A classroom may have 45 to 55 students, while A and B schools have a maximum of 40 students or less and are not allowed to exceed that number. The low grade schools are not allowed to exceed the number of streams in their schools. Firstly because there are no teachers for the extra classrooms and secondly, even if they are allowed there are no funds to do so. Teaching of mathematics encounters a number of problems such as lack of mathematics staff whose problems are mentioned above, and lack of materials. These schools mainly use text books, sometimes - cheap books which are substandard - because they have no funds to buy even those books recommended by the inspectorate. It is impossible to serve every student with a text book because they are far too many. Other materials to aid teaching are non-existent and the worse hit classrooms are forms 1 and 2. The number of students decreases in forms 3 and 4 due mainly to the incidence of drop out. Students dropout because of inability to pay school fees or in some cases ~~too~~ students are forced out by schools themselves, because they do not have teachers, materials etc. for instruction.

Mathematics requires a lot of practice, without books or materials for exercises students will not have a firm background in mathematics. The application of mathematics in everyday life by a student terminating at form two will not be better than a child who terminated at standard 7. The parents will therefore querry the type of mathematics taught in schools. Those students who continue to forms 3 and 4

will not be better at all. From time to time they will not have teachers, or if they have any these may be either incompetant or transferred to a school grade A or B. There has been a tendency of grade A and B school attracting teachers from other schools. As a result these schools are left with no good teachers, [illegible] leaving them extremely helpless.

Purpose of the Study

Without good foundation in form 1 and 2 it will be difficult for children to persue mathematics in forms 3 and 4. Infact the performance in form 2 is normally worse than in form 1. If no solutions are found the situation will continue to deteriorate.

The teachers in the upper classes will hence have alot of difficulties not only in teaching such classes but also in preparing them for the application of mathematics in future and in the other subjects, for further studies and even for examination.

The purpose of this study is therefore to:-

(1) Examine the problems that affect the teaching and learning of mathematics in junior secondary in Kenya.

(2) Suggest measures which could be taken to improve the standard of mathematics in Kenya

CHAPTER II

METHODOLOGY:

The research was confined to one division i.e. Kigumo division in Murang'a District Central Province. However, the researcher felt that there was a need to study 3 more grade A schools outside the Division, 2 of which were outside the province. This is because there was only one grade A school in the division. The reason for this limitation was because of very short time and inadequate funds. It is assumed the findings from the schools studied will show a general view of the issue of the rural areas in Kenya.

2:1 THE POPULATION.

Kigumo division has more than 30 secondary schools, both harambee and government aided and maintained schools. The school selected for study were 17 from the Division, 1 grade A school within the province and 2 grade A chools in coast province and North Eastern Province.
Below is the distribution of secondary schools studied; according to status.

TABLE I

GRADE	NO. OF SCHOOLS
A	4
B	4
C	8
Harambee	4
TOTAL	20

2.2 Procedure Adopted for selecting the population sample.

The target population was the respondents interested in Mathematics. The respondents were mainly head teachers who were not necessarily mathematics orientated and the mathematics teachers of the schools who were expected to give more information about mathematics in Secondary Schools Forms 1 & 2.

The secondary schools selected were those which were within reach and those outside the division were contacted by post and telephone in an effort to make the exercise a success. Furthermore most schools which were left out were poorly established harambee schools. However, since the grade C schools were more, they were selected randomly. The researcher used the random table numbers to select the sample schools for grade C.

There was no selection for head teachers but teachers of mathematics were mainly those who taught mathematics in form 1 or form 2. If these were not in a position to fill the questionnaires the head of mathematics department represented them.

2.3 Instruments For The Data:

There were two instruments developed for data collection namely, mathematics teachers questionnaire ~ and the head teachers questionnaire ~ and interview. These instruments are attached as Appendices I and II.

The mathematics teachers questionnaire consisted of 19 items. Section A of the teachers questionnaire consisted mainly of precoded questions requiring information about the school and personal data of the respondents respectively. In section B, the programme section of the teachers questionnaire, precoded type of items were used to test attitude of teachers to some statements and derive comments from them. In every item there was a space for comments.

In some items statements were given and teachers were required to rank them according to their appropriateness. This could help the researcher to find out what teachers value as important or less important to them.

Another instrument used was the questionnaire for the head teachers, which consisted of 19 items.
Once again precoded items were used and spaces for comments provided. There were also ranking type of items and such items which could give opinions of the Head teachers about their mathematics teachers competence in the teaching profession. In all the instruments there was an open item which catered for any information that may not have been given in other items.

Personal interview was done where the respondents were available and done rather very casually. The researcher got views and suggestions on how the teaching of the subject would be improved. No recording was done to avoid suspicion by the respondents.
The respondents were also free to ask questions which gave crue as to what is happening in the rural areas.
For example,
"How do you expect performance in mathematics to improve without a single trained teacher in this school?
And such comments as "it is unbelievable, one of my teachers asked form ones to sketch the curve of $y = x^4 + x^3$. I didn't do this in form one during our times". Many of these comments and statements will be mentioned in the conclusion of the study. Unfortunately none of the interviews were recorded and will not appear in this study.

2.4 Administration of the questionnaires:

The researcher took the questionnaires to the selected schools. Before the questionnaires were issued a short conversation which included introduction had to take place. Since mathematics is a crucial subject, the respondents asked questions immediately and this is how short interviews arouse. The filled questionnaires were corrected the following day, yet again more questions were asked.

However, the researcher was careful not to waste more time answering and questioning. The questionnaires that were delivered by post took more time and telephone had to be used.

However, all of them were received dully completed as instructed.

CHAPTER III

Data Analysis And Findings:

3.1 All the respondents in the 20 schools responded to the questionnaire. That is 20 Heads of schools and 20 mathematics teachers in forms 1 and 2. Only those items which were considered to give more information and more relevant to the objectives of the study were analysed. Brief comments are given to the rest of the items.

3.2 Data Analysis

The questionnaires were studied carefully, tallying scores where possible item by item. The figures obtained under each item were then converted to percentages.

3.2.1 Qualifications of Head teachers and subject teachers

This item is seen in both head teachers and subject teachers questionnaire. However, the head teacher had to give qualifications of all those teachers teaching mathematics in forms 1 and 2. Table 2 shows the analysis of head teachers and mathematics teachers qualifications.

Qualification

Respondents	'A' Level	P.1	S.1/Approved	B.Ed	BA/B.Sc
H. Teachers	5%	5%	40%	35%	15%
Maths Teachers in Forms 1 and 2.	47.62%	0%	28.57%	24.81 %	0%

3.2.2 Experience in the teaching profession of both head teachers and subject teachers;

The item was intended to investigate the experience of both head teachers and mathematics teachers in the teaching profession.

The time of Headship was included. Table 3 shows the respondents teaching and Headship experience.

Respondents	Exp. Years 1-3	4-7	8-10	11 and above
Head Teachers	5%	25%	10%	60%
Maths teachers Forms 1 and 2.	35%	20%	25%	20%

* In further investigation 40% of the Head teachers particularly in A and B schools and some in C schools do not teach, at present. Their work is purely administration.

3.2.3 The number of periods given for mathematics in forms 1 and 2

This item was administered to both Heads of schools and mathematics teachers. The item asked whether they consider the number of periods allocated to Forms 1 and 2 adequate to cover the syllabus. Table ...A.... shows their response where they seem to disagree. 65% of the Head teachers and 90% of the subject teachers felt the number of periods is adequate, while 35% of the Head teachers and 10% of the subject teachers feel the number of periods inadequate.

Respondent	Response Enough	Not Enough
Head Teachers	65%	35%
Subject Teachers	90%	10%

3.2.4 Attitude of pupils towards mathematics in forms 1 and 2.

The item was to investigate the respondents view of the pupils attitude towards mathematics. They were asked to indicate whether their pupils are very interested, interested or not interested in mathematics.
Table 4 shows the analysis of their response to this item.

	Response		
Respondent	V. Interested	Interested	Not Interested
Head teachers	5%	55%	40%
Subject teachers forms 1 and 2	25%	65%	10%

3.2.5 Availability of Instructional Materials for teaching and learning mathematics:

This item was administered to the Head teachers and mathematics teachers. They were to indicate whether or not they have enough mathematics materials in their schools. As shown in the table, 50% of the Head teachers and 45% of the maths teachers indicated that they have adequate materials. 5% of the teachers did not commit, but blamed the educational authorities in their comment, implying that the materials were not enough.

TABLE 5

	Response		
Respondent	Adequate	Not adequate	Did not commit
Head Teachers	50%	50%	0%
Subject Teachers Forms 1 and 2	45%	50%	5%

3.2.6 The Committment of Mathematics Teachers And Teaching Load

The item was administered to Head teachers. 35% of the maths teachers were reported as very committed, 40% committed and 25% not committed. 20% of the teachers were very overloaded, 25% were overloaded and 55% just enough load, While 85% of the mathematics teachers reported having 27 periods and above per week and 15% having less than 27 periods per week.

Some of the Head teachers argued that it is difficult to measure teachers committments.

3.2.7 Adequacy of Mathematics Teachers

The item was administered to the Head of Schools. This was to investigate whether the schools have adequate mathematics teachers. 35% of the Head teachers reported that they have adequate mathematics teachers. 65% reported inadequate athematics teachers. In both cases there was a general comment that mathematics teachers are very unstable. Most of them leave the teaching profession and replacement is not obtained for a long time. The worst bit schools are grade C and Harambee Schools. Schools with adequate teachers were mainly grade A and B schools.

3.2.8 Frequency of Mathematics Teachers, Meeting.

This item was administered to both Head of schools and mathematics teachers. Table 6 below shows the analysis of the item.

Respondent	Frequency			
	Very often	Only periodically	Meet Rarely	Never Meet
Head Teachers	15%	65%	-	20%
Mathematics Teachers	15%	55%	15%	15%

From the table 15% of the schools mathematics teachers meet very often. This is the case in the already well established schools. It will be seen that in a number of schools 80 - 85% department teachers meet either periodically or rarely or never meet.

The researchers view is that, generally there are no organised department meeting in most schools. Hence no review in mathematics teaching by teachers themselves. Blame is to the Head of schools and the department heads.

3.2.9 Allocation of Other Subjects and Duties

This item was administered to teachers. From the analysis in section 3.2.6, 85% of the teachers pointed out that they have periods above 27 periods and 15% have less than 27 periods.

The 85% were allocated other subjects such as science subjects. 15% taught mainly mathematics. The 15% were from the grade A schools which are well staffed.

3.2.10 The factors that have made performance in mathematics poor

The item was administered to the Head of schools. This was to investigate why performance in mathematics have been poor in the recent years. The respondents were asked to rate given statements as very important, important, less important and not important. Some of the respondents did not respond to some statements. Table 7 below show the analysis of the response by the Heads of schools.

Ratings

	Statements	Very important	Important	less important	Not Important	Did not Respond
(a)	Students think Maths is a difficult subject.	30%	45%	15%	0%	20%
(b)	Poor teaching Methods	0%	60%	0%	15%	25%
(c)	Lack of good books and materials	20%	50%	0%	15%	15%
(d)	More emphasis on other subjects	0%	35%	35%	10%	20%

3.2.11 Opinions on Improving the teaching and learning of mathematics

The item was administered to both Head teachers and subject teachers. This was to investigate the respondents opinions on how mathematics teaching and learning would be improved. Again the respondents were asked to rate given statements as very important, important, less important and not important.
Some of the respondents particularly Head teachers did not respond to some of the statements.
Table 8 shows the analysis of the response by the Head teachers (H.T) and Subject teachers (S.T.).

Statements	Ratings				
	Very Important	Important	Less Important	Not Important	Did not Respond
(a) Regular Inservice Courses for Maths teachers	H.T:50% S.T:55%	H.T:35% S.T:20%	H.T:0% S.T:25%	H.T:0% S.T:0%	H.T:15% S.T:0%
(b) Constant review of Maths Syllabus	H.T:20% S.T:45%	H.T:40% S.T:20%	H.T:20% S.T:35%	H.T:0% S.T:0%	H.T:20% S.T:0%
(c) Making Maths Books relevant and sufficient	H.T:40% S.T:70%	H.T:55% S.T:20%	H.T:0% S.T:5%	H.T:0% S.T:5%	H.T:5% S.T:0%
(d) To Involve teacher in Maths Curriculum development.	H.T:30% S.T:25%	H.T:45% S.T:55%	H.T:0% S.T:20%	H.T:0% S.T:0%	H.T:25% S.T:0%
1* (e) Emphasising memory of Maths facts and concepts	H.T:5% -	H.T:5% -	H.T:30% -	H.T:35% -	H.T:25% -
2* (f) Involving Teachers marking exam papers.	- S.T:25%	- S.T:70%	- S.T:5%	- S.T:0%	- S.T:0%

1* This item appeared in Head teachers questionnaire only and

2* appeared in subject teachers only.

H.T. - HEAD TEACHER

S.T. - SUBJECT TEACHER

3.2.12 Rating of various methods of teaching:

This item was administered to the mathematics teachers. This was to investigate which methods of teaching mathematics are commonly used.
The responds were asked to rate a given method as used very regularly, regularly, less regularly and not regularly used. Table 9 shows the analysis of the mathematics teachers response.

	Frequency			
Methods	Very Regularly	Regularly	Less Regularly	Not Regularly.
Teacher lecturing	15%	0%	85%	0%
Heuristic method	40%	30%	20%	10%
Class discussion and/or group work	60%	40%	0%	0%
Discovery method	25%	50%	25%	0%
Question and Answer	10%	65%	25%	0%

3.2.13 Relevance of the syllabus:

This item was administered to mathematics teachers. This was to investigate the teachers opinion on the relevance of the syllabus. 15% of the teachers admit that the syllabus is very relevant, 75% relevant and 10% not relevant.

Some of the comments are such as; "The present syllabus has a lot of everyday applications, especially the numerical examples for those who might settle in the rural areas". "The content should have a direct application to students everyday life", "A lot of geometry construction should be included and Transformation geometry left out", and "It would be more relevant 'if ' more support materials accompany the syllabus".

3.2.14 Whether forms 1 and 2 have done without maths teachers for sometime:

This item was administered to teachers of the subject. 15% have done without teachers for sometime. The time ranged from one term to two terms. 85% have been with teachers throughout.

However, instability of trained mathematics teachers was generally viewed. Those in the 85%, presence of a teacher were not necessarily trained mathematics teachers. They teach because there is no mathematics teacher.

3.2.15: Teachers Comments on the Performance of Mathematics In the Past and General Comments:

There were parts (a) and (b) under this item. Part (a) required the teacher to comment why in the past years mathematics performance have been extremely poor. They highlighted some of the reasons below:

(i) There are no regular In-service courses for mathematics teachers.

(ii) Frequent changes in the syllabus without giving enough guidelines and materials for teaching and learning of mathematics. Hence poor teaching due to lack of teaching materials in most schools.

(iii) Most students take mathematics to be a difficult subject compared with other subjects.

(iv) There are no permanent teachers for mathematics. A good number of mathematics teachers resign every year.

(v) The previous mathematics syllabus(es) had too abstract mathematics.

(vi) There has been poor foundation in mathematics at primary level. Pupils work mathematics slovenly because of multiple choice. They therefore take time to realise the importance of methodical work.

(vii) Some mathematics teachers felt that they need to know how the marking of examination papers is carried out. Hence sending them the marking schemes and analysis of each questions performance.

Part (b) of this item was more or less linked to part (a) and therefore beared similar comments as above.

4.2.16: Head teachers General Comments About Mathematics

This item called for the Head teachers comments about mathematics. In other items in the questionnaire there were spaces left for further comments about the item. The comments have been considered together with their last comments in this item. Below are some of their views.

(i) Mathematical materials have never been sufficient and they receive most complains from mathematics teachers. There has been no adequate guidelines on the new syllabus. The old mathematics text books have not been revised for a long time. This view was also given by the teachers.

(ii) Competence of teachers is questionable. Firstly some teachers have been in the old system of mathematics and the young teachers have started with a new syllabus. As a result adaptation to a new syllabus takes time.

Secondly there are no enough motivation methods. Circumstances force teachers to teach mathematics though not fully qualified to teach the subject. Mobility of qualified mathematics teachers is quite high. Most of them resign teaching profession for better paid jobs. Others are promoted to positions that do not really need their services, implying that they are under utilised.

(iii) Teachers should meet quite often to discuss the syllabus and examination setting before and after examination papers.

(iv) Training of teachers must be intensified, particularly emphasis on inservice courses for both trained and untrained teachers. Inspection by the inspectorate should be regular. Information through circulars and seminars where possible should be done and teachers should be asked to comment on materials provided by Kenya Institute of Education.

CHAPTER IV

CONCLUSION.

The purpose of the study was to examine the problems that affect the teaching and learning of mathematics in Junior Secondary in Kenya and to suggest measures which could be taken to improve the standard of mathematics in Kenya.

The study was worthwhile because of the increasing criticisms on mathematics curriculum, its poor application by pupils and mass failures in mathematics examinations at secondary level.

According to the analysis of the questionnaire items in the previous chapter, it is possible to identify the problems and the measures which would be taken to improve the standard of mathematics. These were largely viewed by the mathematics teachers and Heads of secondary schools.

In general the problems of teaching secondary mathematics has been a result of the following factors.

(a) Mathematics curriculum. There has been frequent changes in the mathematics syllabus without giving enough guidelines and materials for teaching and learning of mathematics.

(b) The shortage of mathematics teachers is very acute. Most of the trained mathematics teachers resign for jobs with better terms of employment. There is also a tendency to promote them to positions that do not require their services. In other words mobility of mathematics teachers is quite high.

(c) There has been poor foundation in mathematics at primary level. This is partly a result of a large number of untrained teachers and lack of regular inservice courses of primary teachers.

Pupils work mathematics slovenly because of multiple choice. They, therefore, take time to realise the importance of methodical work and problem solving techniques.

(d). In-service training of both trained and untrained teachers is not regular. Sometimes no in-service courses are organized for a whole year. This is mainly to lack of funds and if any course is to be offered, very few teachers are involved.

(e) Psychological aspect on the part of the pupils. Most pupils think that mathematics is a difficult subject. Its emphasis by the teachers and employers and why it has been made a compulsory subject is mysterious to pupils.

(f) The teachers themselves are reported not be competent with the subject. The adaptation of teachers to new systems takes a long time. This implies orientation courses are not regularly held.

(g) Teachers do not meet often to review the standard of mathematics in their schools. The Heads of schools and the Heads of departments do not seem to emphasise the departmental meetings.

With the view of the above factors the following measures would be taken to solve the problems:-

(a) Frequent inservicing of teachers to make them aware of the new developments of the mathematics curriculum. Funds should be made available.

(b) For any new curriculum, sufficient materials and guidelines should be made immediately.

(c) Teachers should be involved in the development of the curriculum and production of support materials. While doing this, co-ordination should be made for primary and secondary mathematics teachers.

(d) Better terms of employment for teachers should be reviewed and chances of promotion while in teaching service be widened in an attempt to retain mathematics teachers for a longer time. At present there are only two positions of promotion for teachers i.e. as deputy head or as Headmaster. There are fewer chances of a teacher to be promoted to these position. A good teacher should remain in the classroom but his renumeration be attractive.

(e) Teachers should be exposed to the examination system. That is item writing and marking of scripts. This would help them understand testing techniques and pupils problems in answering questions.

(f) The inspectorate should be more regular and information through circulars and seminars should reach the teacher as soon as possible.

Some schools have been victims of not receiving latest circulars from the inspectorate and K.I.E.

In addition to this, harambee schools and private schools should be regularly inspected and their employment system checked. The number of pupils per class in these schools should be limited and quality of teaching materials scrutinized.

APPENDIX L

QUESTIONNAIRE FOR HEADS OF SECONDARY SCHOOLS

The purpose of the questionnaire is to investigate the problem of teaching mathematics in secondary schools Forms I and II in Kenya.

You are requested to fill this questionnaire as faithfully as possible. Do not write your name.

SECTION A — The School

1. Name of the school .....
2. Status of school

   (a) A Government maintained school
   B Government Aided school
   C Harambee school
   D Private school
   E Other status .....
   .....
   .....
   .....

   (b) A. Boys Boarding/Day school
   B. Girls Boarding/Day school
   C. Mixed Boarding/Day school

   * Boarding/Day delete what ever is inappropriate

SECTION B — Personal

3. Sex
   A Male
   B Female

4. Qualifications e.g. B.Ed, M.Ed, B.Sc, M.Sc Approved Teacher, S.I, etc

5. Teaching experience in years (include experience as Headmaster)

_____

_____

_____

6. Teaching subject inorder of Preference

(a)

(b)

(c)

SECTION C — The Programme

7. Do you consider the number of Periods allocated to mathematics in forms I and II adaquate to cover the syllabus.

(a) Yes

(b) No

Comment _____

_____

_____

8. What is the general attitude of the students in forms I and II in your school towards mathematics as a subject of study.

(a) Very Interested

(b) Insterested

(c) Not Interested

Comments _____

_____

_____

9. Has the school got sufficient instructional materials for mathematics teaching.

(a) Yes

(b) No

Comment _____

_____

_____

10. How would you say the examination system has in fluenced the teaching of mathematics generally.

(a) Positively
(b) Negatively
(c) Has no influence

Comments _____

_____

_____

_____

11. What would you say about the committment of mathematics teachers in your school.

(a) Very commited
(b) Committed
(c) Not committed

Comments _____

_____

_____

_____

12. What would you say about the teaching load of the teaching force in mathematics department of your school.

(a) Very over-loaded
(b) Over-loaded
(c) Just enough teaching load
(d) Light time - tabled

Comments _____

_____

_____

_____

13. Do you have adequate mathematics teachers

(a) Yes

(b) No

Comments _____

_____

_____

_____

14. How many teachers teach forms I and II mathematics and what are their qualifications

_____

_____

_____

15. How often do the mathematics teacher in your school meet to review mathematics teaching and how to organise the department.

(a) Very often

(b) Only Periodically

(c) They never meet.

Comments _____

_____

_____

_____

16. Are those teachers teaching mathematics in forms I and II allocated other classes for the same subject or other subject (mention these other subjects, classes and duties in your comments below)

Yes

No

Comments _____

_____

_____

SECTION D

For No. 17 and 18 you are requested to write either very important, important, less important, not important where applicable for each statement. a,b,c,d,e .....

17. Performance in mathematics has been poor in the last few years. To what extent do you consider these factors important in explaining this poor performance

(a) Students think mathematics is difficult subject to study _____

_____

(b) Poor teaching methods

(c) Lack of good books and other teaching aids

(d) More emphasis in other subjects

(e)

18. Which of the following in your opinion would do most to improve the teaching and learning of mathematics in Kenya.

(a) Regular Inservice Courses for mathematics teachers

(b) Constant review of the maths syllabus

(c) Making mathematic text books more relevant and sufficient.

(d) To involve teachers in the maths curriculum development

(e) Emphasising memory of maths facts and concepts

19. If you have any other comment concerning mathematics put it in the space provided.

_____

_____

_____

_____

_____

APPENDIX II

QUESTIONNAIRE FOR TEACHERS

This questionnaire should be filled by a maths teacher teaching forms I and /or II with the assistance of Head of department.

The purpose of the questionnaire is to investigate the problems relating to the teaching of mathematics in secondary schools Forms I and II in Kenya.

You are requested to fill in this questionnaire as you can Do not write your name.

Put a tick where necessary. Please write name of your school.

SECTION A — PERSONAL

1. Sex
   - A Male
   - B Female

2. Present qualification i.e. Dip.Ed, B.Ed, S.I, Approved teachers, 'A' level Std. B.A., B. Sc. etc

   _____

   _____

   _____

3. Teaching experience in years
   - A 0 - 3 years
   - B 4 - 7 years
   - C 8 - 10 years
   - D 11 and above years

4. How long have you taught mathematics
   - A 0 - 3
   - B 4 - 7
   - C 8 - 10
   - D 11 abd above

5. How do you like your profession
   (a) Very much
   (b) Moderately
   (c) Very little
   (d) Not at all

SECTION B — The PRogramme

9. How many Periods do you teach per week, which subjects and classes (Below delete that is not applicable)

Subject	Forms	Periods
Mathematics	II	
Physics		
Physics/Biology		
Biology/Chemistry		
Others		
Total		

10. What would you say about the relevance of the content of mathematics syllabus to the countrys needs.
   (a) Very relevant
   (b) Relevant
   (c) Not relevant
   Comments _____

11. Do you consider the number of periods allocated to mathematics in forms I and II adequate

(a) Yes
(b) No
Comments. _____

_____

_____

_____

12. What is the general attitude of your forms I and II students to mathematics.
(a) Very Interested
(b) Interested
(c) Not Interested
Comments _____

_____

_____

_____

13. Has your school got sufficient materials for teaching mathematics
(a) Yes
(b) No
Comments _____

_____

_____

_____

_____

_____

14. What do you do when you realise that your students are are not interested in learning mathematics.

_____

_____

_____

_____

15. Has forms I and II missed a mathematics teacher for any given time?
    (a) Yes
    (b) No
    Comment with reasons if yes

    _____
    _____
    _____
    _____

16. How often do the mathematics teachers meet in your school to review the teaching of mathematics
    (a) Very often
    (b) Only Periodically
    (c) Rarely
    (d) They never meet
    Comments. _____
    _____
    _____
    _____
    _____

For numbers 17 and 18 you are requested to put a tick where applicable for each statement.

17. Rate the following methods as you usually us them in teaching mathematics.

	Very regularly	Regularly	Less regularly	Not regularly
(a) Teacher lecturing				
(b) Hueristic method				
(c) Class discusion and/ or group work				
(d) Discovery method				
(e) Question and answer method				

18. Which of the following in your opinion would do to improve the teaching and learning of mathematics.

	Very Important	Important	Less Important	Not Important
(a) Regular inservice for teachers				
(b) Constant review of present syllabus				
(c) Making maths text-books relevant and sufficient				
(d) Involving teachers in marking exam papers				
(e) Involving teachers in making the syllabus				

19. (a) In the past years mathematics performance has been extremely poor. Comment on the above statement

(b) If you have any other comments to make on the content, teaching and learning of mathematics, put them on the space provided.

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